

REMARKS

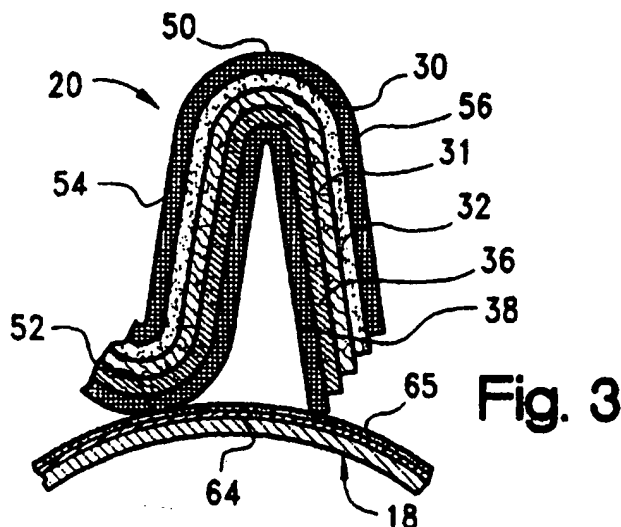
By the present amendment, the specification has been amended to correct a typographical error, claims 1, 7, 10, 20, 26, 40, 41, 44 and 52 have been amended, claims 53-65 have been added, and claim 21 has been canceled. Upon entry of this amendment, claims 1-7, 10, 18-20, 22, 23, 25, 26, 39-46 and 52-65 will be pending in the application. A clean reading of the amended paragraph and a clean listing of the claims (sorted by independent claims) are attached.

Claim Rejections – 35 U.S.C. §112

Claims 1-7, 41, 44, and 52 have been rejected for indefiniteness. By the present amendment, claims 1, 41, 44 and 52 have been amended in a manner believed to eliminate any indefiniteness issues.

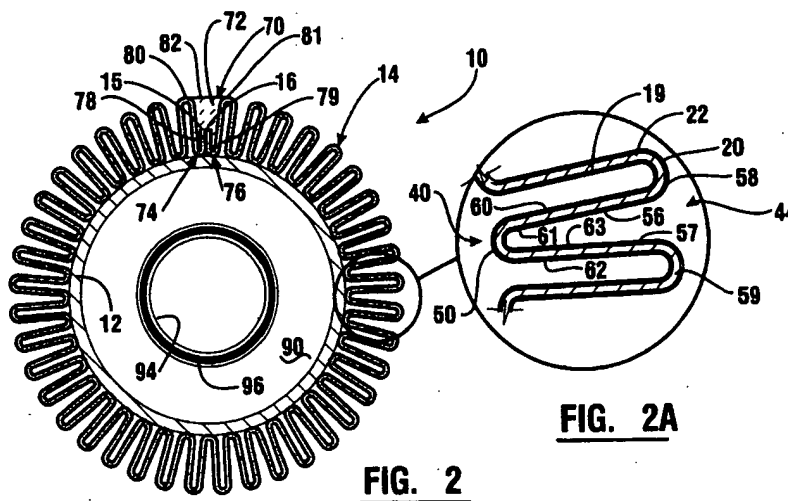
Claim Rejections – 35 U.S.C. §102

Claim 10 has been rejected as being anticipated by International Publication No. WO 97/31695 to Cella. Cella discloses a filter media 20 comprising an outer support mesh or screen 30, a microfiber capacity layer 31, an adhesive web layer 32, a microfiber filtration layer 36, and inner support mesh layer. (See Cella Figure 3, below.)



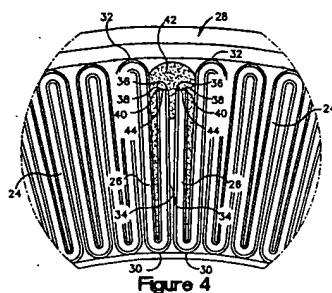
Claim 10 now sets forth that the layers of the filter media consist essentially of the filtration layer, the inner layer, and the outer layer. Accordingly, claim 10 and added claims 53-58 are believed to be patentable over this reference.

Claims 20-22 and 25 have been rejected as being anticipated by U.S. Patent No. 5,762,796 to Zraik. Zraik discloses a filter element 10 having a side seam 70 comprising a mass adhesive 72 applied in a band or ribbon. Specifically, the adhesive 72 is disposed within the cavity of a pleat 74 including side edge 15 of the filter material and within the cavity of a pleat 76 including the other side edge 16 of the filter material. The cavities of the pleats 74 and 76 are filled with adhesive such that the adhesive fills the entire pleat cavities from sidewall to sidewall. (See Zraik Figure 2, below.)



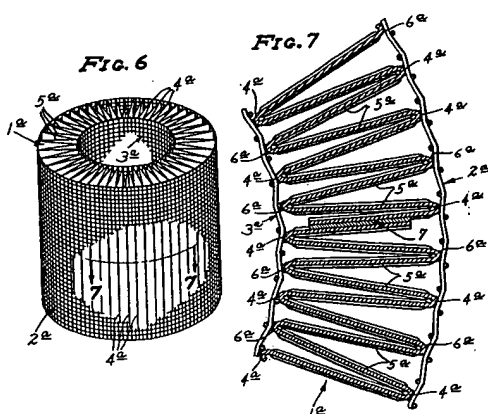
Claim 20 now recites that the adhesive bead extends radially inward between the respective sidewalls of the end pleats¹ and claim 25 recites that the adhesive bead extends radially inward between the endmost sidewalls of the end pleats. For example, in the preferred and illustrated embodiment of applicant's side seam 28, the adhesive bead 42 extends radially inward between the adjacent inner layers 34 of the two end pleats 26. (See Figure 4, below.)

1. This subject matter was incorporated from dependent claim 21 (now canceled), whereby no new issues are created by the amendment of claim 21.



It is respectfully submitted that the Zraik reference does not show or suggest such a side seam adhesive arrangement. The Zraik patent specifically notes that the side edges 15 and 16 are "substantially flush with one another" and that "the adhesive overlaps the seam between the adjacent side edges 15, 16 to encapsulate these edges." The Zraik adhesive appears to surround the flush endmost sidewalls, but does not extend radially inward between these flush sidewalls. Accordingly, claims 20-22 and 25 are believed to be patentable over the applied art.

Claims 26, 39 and 44-46 have been rejected as being anticipated by U.S. Patent No. 3,216,578 to Wright. Wright discloses a cylindrical filter unit comprising a pleated filter element (1a) and screens (2a and 3a) embracing the outer and inner radial pleat edges. (See Wright Figures 6 and 7, below.)



The Wright screens may be "of any suitable material or configuration having suitable rigidity and porosity" but "may be assumed to be of woven metallic metal having a much greater porosity than the pleated filter element and having much greater rigidity than said filter element." An objective of the Wright invention is to increase the strength of the radial edges of the filter pleats (4a)² by applying a protective capping (6a) "over the sharp pleat edges from end to end of each thereof" to protect the pleat edges against deteriorating effects resulting from abrasion, heat, or the like. (See Wright Figures 6 and 7, above.) The protective capping is adhesive, whereby it is also utilized as "a bonding medium" between the pleat edges and the adjacent screen (2a or 3a) to "positively anchor the pleated filter element against flexing and distortion."

Claim 26 now sets forth the support screen is non-adhesively attached to the peaks and claim 39 set forth that the support screen is thermally bonded to each of the radially-outer peaks or each of the radially-inner peaks. It is respectfully submitted that Wright does not show or suggest such a non-adhesive screen attachment and, moreover, such an attachment method would destroy objectives of the Wright invention as the adhesive is also used for crucial pleat-strengthening purposes.³ Accordingly, claim 26 (and added claim 59 depending therefrom) and claim 39 (and claims 44-46 and added claim 64 depending therefrom) are believed to patentable over the Wright reference.

2. Apparently, "when the pleated filter element has been formed by sharp bending or folding of flat sheet material . . . the material is generally weakened by folding." Also, when filters are used with air intake systems of internal combustion engines which are subject to occasional backfire or hot combustion gases, the sharp pleat edges are "highly vulnerable" to the deteriorating affects of the hot backfire gases. The Wright patent comments that "it has been frequently noted that such hot backfire gases often scorch the unprotected sharp pleat edges of prior art pleated filter elements, thereby greatly reducing the useful life thereof."

3. The Examiner notes in the Office Action that Wright teaches "welding or soldering" of the screen and that this constitutes "thermal bonding." This reference does disclose that opposite ends of the screen can be permanently joined by suitable means such as welding, soldering or the like. It is respectfully submitted that Wright does not show or suggest welding or soldering the screen to the peaks of the pleats. Accordingly, Wright does not teach screen-to-peak thermal bonding.

Claim Rejections – 35 U.S.C. §103

Claims 1 and 18-19 have been rejected as being unpatentable over Cella in view of U.S. Patent No. 5,552,048 to Miller. Cella discloses a filter media having five pleated layers including an **outer support layer** having “sufficient strength to withstand differential fluid pressure across the filter element” and an **inner support layer** preferably comprising the same material as the outer support layer. Miller discloses a filter element comprising an upstream **support and drainage layer**, a cushioning layer, a filter layer, a downstream **support and drainage layer**, and polymeric beads disposed on the downstream surface of the downstream support and drainage layer. Thus, both Cella and Miller show use of an endoskeleton (*i.e.*, support layers) for its filter element.

Claim 1 sets forth an **exoskeleton** comprising a support screen providing at least 50% open flow area and a tight array of attachment points so that the filter media is sufficiently supported **without having** cellulose-fiber and/or woven-mesh **endoskeleton support layers**. It is respectfully submitted that neither Cella nor Miller provides any suggestion to include a support screen with a flow area and/or attachment points so that the filter media is sufficiently supported without having cellulose-fiber and/or woven-mesh support layers. As both Cella and Wright have endoskeleton structures, these references simply could not motivate one of ordinary skill in the art to modify the Cella filter element to provide it with the claimed exoskeleton support structure.

In this regard, note the statement in Cella that such helical or spiral wraps “can be time-consuming and require significant amounts of wrap material” and that such an exterior wrap “can also have issues with appearance.” Accordingly, any incorporation of the Miller spiral wrap into the Cella filter element cannot be considered obvious.

Claim 1 also sets forth, and claims 18 and 19 set forth, a pleat density of about eight or more pleats per inner diameter inch. The Examiner appears to contend that it would have been obvious to modify the Cella and/or Miller filter elements so that they possess this pleat density. However, pleat density is not simply a matter of choice, it is dictated by the structure of the filter medium. Specifically, a filter element including

endoskeleton support layers (such as Cella and/or Miller) can be too "bulky" or "rigid" to allow a high pleat density.

As for Miller's statements regarding the positioning of its spacing beads, it is respectfully submitted that this simply provides the number of beads per pleat and does not provide any insight on pleat density. The patent states that the "the spacing between evenly spaced beads 25 is preferably such that about 5 to about 20 beads per inch or, more preferably, about 8 to about 15 beads per inch are applied to the downstream drainage layer 24." In the pre-pleated filter medium, the spaced beads 25 constitute longitudinal lines (see Miller Figure 3, below), whereby each pleat will include each of the bead lines (see Miller Figure 2, below). Accordingly, claims 1, 18 and 19 are believed to be patentable over the applied art.

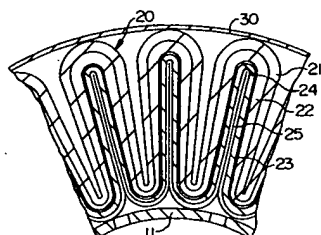


FIG. 2

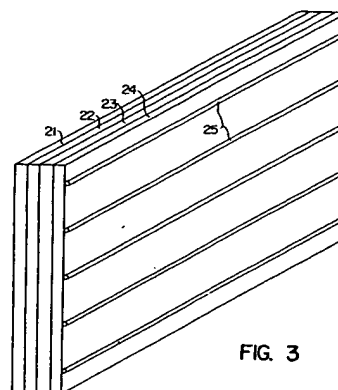
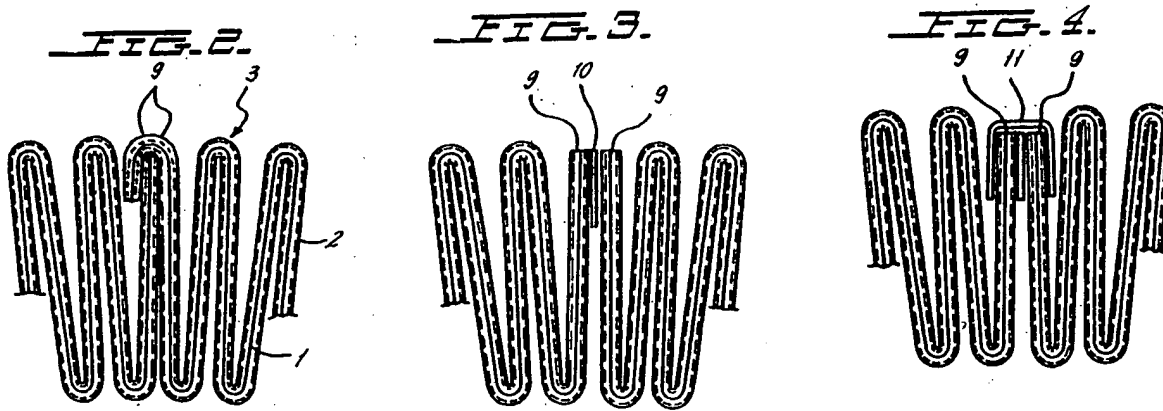


FIG. 3

Claims 2-3 and 7 have been rejected as being unpatentable over Cella in view of Miller and further in view of U.S. Patent No. 4,588,464 to Miyagi. Miyagi discloses a filter element made wholly of fluorocarbon resin consisting of a filter membrane 1 and two net supportors 2 between which the filter membrane 1 is sandwiched. (See Miyagi Figure 2, below.) The edge parts 9 of the filter membrane are joined together by placing a strip of sealing tape 10 followed by integrally welding (see Miyagi Figure 3, below) or by covering the edge parts 9 with a sealing cover 11 followed by integrally welding (see Miyagi Figure 4, below).

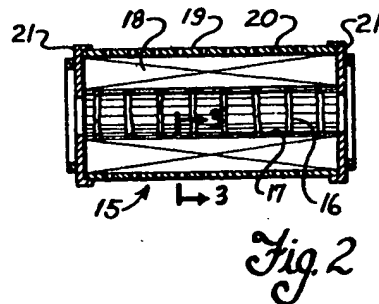


As an initial matter, it is noted that claims 2, 3 and 7 depend from claim 1. It is respectfully submitted that Miyagi does not cure the above-discussed shortcomings of the proposed Cella/Miller combination. Specifically, the Miyagi reference does not show or suggest an exoskeleton comprising a support screen providing at least 50% open flow area and a tight array of attachment points and/or does not show or suggest a pleat density of about eight or more pleats per inner diameter inch. For this reason alone, claims 2, 3 and 7 are believed to be patentable over the applied art.

Claim 23 has been rejected as being obvious over Zraik in view of Miller. Claim 23 depends from claim 20, and thus now recites that the adhesive bead extends radially inward between the respective sidewalls of the end pleats. As was discussed above, Zraik is not believed to show or suggest such an adhesive arrangement and Miller does nothing to cure this discrepancy. Accordingly, claim 23 is believed to be patentable over the applied art.

Claims 40-41 have been rejected as being unpatentable over Wright in view of U.S. Patent No. 3,306,794 to Humbert. Claim 42 has been rejected as being unpatentable over Wright and Humbert in view of Cella. Claim 43 has been rejected as being unpatentable over Wright in view of Cella. These claims depend from claim 39, and thus set forth that the support screen is thermally bonded to each of the radially-outer peaks or each of the radially-inner peaks. It is respectfully submitted that Wright, Humbert, and/or Cella do not disclose such thermal bonding, whereby claims 40-43 are believed to be patentable over the applied art for at least this reason.

Claim 52 has been rejected as being unpatentable over U.S. Patent No. 3,752,321 to McLaren in view of Wright. McLaren discloses a coalescing element, wherein a pleat deformation control ribbon 16 is adhered to the inner pleat terminations 7 and respective adjacent surfaces of each pleat leg 9. (See McLaren Figure 2, below.) The ribbons 16 are applied by extruding a heat-softened adhesive in annular bands onto the inner diameter of the element as it is rotated.



Claim 52 now sets forth that the exoskeleton comprises a support screen non-adhesively bonded to each of the radially inward peaks. It is respectfully submitted that neither McLaren nor Wright⁴ shows such a support screen, whereby claim 52 is believed to be patentable over the applied art.

Accordingly, claims 1-7, 10, 18-20, 22, 23, 25, 26, 39-46 and 52-65, and also added claims 53-65, are believed to be patentable over the applied art.

Conclusion

In view of the foregoing, the present application is believed to be in a condition for allowance and an early indication to that effect is earnestly solicited.

4. As was explained above, Wright specifically teaches the use of an adhesive for attachment of its grid, as the adhesive also forms "caps" apparently considered crucial for pleat-strengthening purposes.

Should a petition for an Extension of Time be necessary for the timely reply to the outstanding Office Action (or if such a petition has been made and an additional extension is necessary), petition is hereby made and the Commissioner is authorized to charge any fees (including additional claim fees) to Deposit Account No. 18-0988, Order No. PARKP0148US.

Respectfully submitted,

RENNER, OTTO, BOISSELLE & SKLAR, P.L.L.

By Cynthia S. Murphy
Cynthia S. Murphy
Reg. No. 33,430

1621 Euclid Avenue
Nineteenth Floor
Cleveland, Ohio 44115
(216) 621-1113

CERTIFICATE OF MAILING (37 CFR 1.8a)

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, Washington, D.C. 20231.

Date: December 9, 2002

Marian E. Vasquez
Marian E. Vasquez

APPENDIX

Detailed listing of changes to both the specification and claims. Please note, underlining denotes additions and [brackets] denote deletions.

In the Specification:

Page 13, lines 16-26 has been amended as follows:

A fixture block 86 is provided for application of the screen material 80 to the filter media, this [bock] block 86 having a pocket 88 with dimensions corresponding to the cylindrical shape of the filter media. Specifically, the pocket 88 has a width corresponding to the outside circumference of the cylinder and a length corresponding to its axial length. The filter media's pleats 24 are placed within the pocket 88 except that the end pleats 26 and one adjacent pleat 24 are positioned on the lateral edges around the pocket 88. A heat/pressure device, such as the illustrated constant heat iron 90, can then be used to thermally bond the section 84 of the screen material 80 to the pocketed pleats of the filter media. (Figure 9B.) The end sections 82 of the screen material are not yet bonded to the filter media.

In the Claims:

Claims 1, 7, 10, 20, 22, 26, 40, 41, 44, and 52 have been amended as follows:

1. (Amended) A microfilter element for removing impurities in the range of about 0.5 μm to about 25.0 μm from aviation fuel, said element comprising a cylindrical filter media and an exoskeleton for the filter media;

the filter media including a filtration layer sandwiched between inner and outer layers;

the filtration layer being made of fiberglass [and/or] or at least one polymer;

the inner and outer layers being made of a non-woven polymer;

the layers of the filter media being folded into a plurality of longitudinally-

extending pleats with a density of about 8 or more pleats per inner diameter inch;
the exoskeleton comprising a support screen bonded to peaks of the pleats to support the pleats in an appropriately spaced and non-collapsed condition;
the support screen providing at least 50% open flow area and a tight array of attachment points so that the filter media is sufficiently supported without having cellulose-fiber and/or woven-mesh endoskeleton support layers.

7. (Amended) A microfilter element as set forth in claim 1, wherein the plurality of longitudinally-extending pleats include two end pleats joined together at a side seam, [and] wherein the side seam comprises an adhesive bead which encapsulates all of the layers in distal ends of the end pleats, and wherein the adhesive bead extends radially inward between the end pleats.

10. (Amended) A filter element comprising a cylindrical filter media and an exoskeleton support structure surrounding the filter media;
the filter media being formed from only cellulose-fiber-free and woven-mesh-free layers including a filtration layer sandwiched between inner and outer layers;
the layers of the filter media being folded into a plurality of longitudinally-extending pleats having radially-inner peaks defining an inner diameter, radially-outer peaks defining an outer diameter, and side walls extending therebetween;
the exoskeleton support structure being attached to the radially-outer peaks and/or radially-inner peaks in such a manner that the filter media is sufficiently supported without cellulose-fiber and/or woven-mesh endoskeleton support layers;
wherein the layers of the filter media consist essentially of the filtration layer, the inner layer, and the outer layer.

20. (Amended) A cylindrical filter media comprising a plurality of longitudinally extending pleats and a side seam;
the plurality of pleats including two end pleats each including a filtration layer, an inner layer and an outer layer;

the two end pleats each having a distal end, a radially-inner peak, an endmost sidewall extending from the distal end to the radially-inner peak, and a radially outer peak;

the sidewalls being positioned adjacent each other and the distal ends being positioned radially outward relative to the radially-inward peaks; and

the side seam comprising an adhesive bead which encapsulates all of the layers in the distal ends of the end pleats;

wherein the adhesive bead extends radially inward between the respective sidewalls of the end pleats.

22. (Amended) A cylindrical filter media as set forth in claim [21] 20, wherein the adhesive bead extends circumferentially between the radially outward peaks of the two end pleats.

26. (Amended) A filter element comprising a cylindrical filter media and an exoskeleton support structure for the filter media;

the cylindrical filter media comprising a plurality of longitudinally-extending pleats having radially-inner peaks defining an inner diameter, radially-outer peaks defining an outer diameter, and side walls extending therebetween;

the exoskeleton support structure comprising a support screen having a first set of cords extending in a first direction, a second set of cords extending in a second direction and intersecting with the first set of cords, and openings defined therebetween;

the cords being attached to each of the radially-outer peaks or each of the radially-inner peaks thereby exoskeletonally supporting the pleats in an appropriately spaced and non-collapsed condition;

adjacent cords in the first set being separated from each other by a distance d_1 , adjacent cords in the second set being separated from each other by a distance d_2 , and adjacent radially-outer peaks being separated from each other by a distance d_{pleat} ; and

the distance d_1 between the first set of cords being about half to about twice the distance d_{pleat} between adjacent radially-outer peaks;

wherein the support screen is non-adhesively attached to the peaks.

40. (Amended) A filter element as set forth in claim 39, wherein the side seam extends substantially parallel to [the] a longitudinal axis of the filter media[:].

41. (Amended) A filter element as set forth in claim 39, wherein the lateral edges overlap and are non-adhesively thermally bonded together.

44. (Amended) A filter element as set forth in claim 39, wherein the sheet of screen material is rectangular in shape prior to its lateral edges being joined together at the side same.

52. (Amended) A coalescer element for removing free water and particulates from aviation fuel, said element comprising a cylindrical media and an exoskeleton for the media;

the cylindrical media comprising a plurality of longitudinally-extending pleats having radially inward peaks;

the exoskeleton comprising a support screen non-adhesively bonded to each of the radially inward peaks of the pleats to support the pleats in an appropriately spaced and non-collapsed condition; and

the support screen providing at least 50% open flow area and a tight array of attachment points so that the filter media is sufficiently supported without a central support tube.